UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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February 4, 2020

Catherine Jerrard
Program Manager/BEC
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706 Hangar Road
Rome, New York 13441

RE**:** Review of the Draft Soil Vapor Extraction System and Pilot Study 2018 Annual Performance Report, Former Liquid Fuels Storage Area Site ST012, Former Williams Air Force Base, Mesa, Arizona, December 2019

Dear Ms. Jerrard:

EPA has reviewed the Draft 2018 Annual Performance Report for the Soil Vapor Extraction(SVE) system and Enhanced Bioremediation (EBR) pilot study activities. We offer the following comments on the report:

GENERAL COMMENTS

1. Some figures in the Draft Soil Vapor Extraction System and Pilot Study 2018 Annual Performance Report, Former Liquid Fuels Storage Area Site ST012, Former Williams Air Force Base, Mesa, Arizona, December 2019 (the Draft Report) are missing groundwater direction arrows. For example, Figures 3-7 (ST012 LSZ [lower saturated zone] Benzene Concentrations in Groundwater November 2018) and 3-8 (ST012 LSZ Naphthalene Concentrations in Groundwater November 2018) in Appendix O (Groundwater Annual Report) are missing groundwater direction arrows. Please ensure groundwater flow direction arrows are added to figures presenting groundwater analytical results.

SPECIFIC COMMENTS

1. **Section 2.1.4, SVE Condensate Accumulation, Page 2-9:** Section 2.1.4 states that approximately 24,023 gallons of soil vapor extraction [SVE] condensate were generated, but the number of gallons of SVE condensate generated based on the quarterly numbers provided equals 24,215 gallons. Please resolve this discrepancy or revise the text to explain the discrepancy between the approximation of 24,023 gallons provided in Section 2.1.4 and 24,215 gallons based on adding the quarterly numbers provided.

2. **Section 2.2.1.1, SVE Vapor Sample Analysis, Page 2-14 and Table 2-7, Summary of SVE Gas Measurements, Page 2-14:** Section 2.2.1.1 states that, "Collectively, O2 [oxygen], CH4 [methane], and CO_2 [carbon dioxide] data indicate that microbial activity, including VOC [volatile organic carbon] biodegradation, is occurring in the SVE treatment zone;" however, the text does not discuss how the data presented in Table 2-7 indicate that microbial processes are occurring. Rather, the text provides an overview of the gas measurements and does not explain how each gas and the observed results relate to microbial activity. Please revise the text to discuss how the data obtained relate to microbial activity.

3. **Section 2.2.1.2, SVE Process Monitoring, Page 2-19 and Appendix B, SVE Field Monitoring Results:** The source of the temperature information presented in Section 2.2.1.2 is unclear. For example, Section 2.2.1.2 states that the average wellfield temperature was 106.5 degrees Fahrenheit (°F) but 106.5°F is the annual average as listed in Appendix B (PDF Page 118) and no temperature data was collected between June 6, 2018 and December 13, 2018. Additionally, Section 2.2.1.2 states that the inlet controller temperature for the thermal oxidizer ranged from 1,380 to 1,405°F but 1,380°F could not be identified in Appendix B. Please revise the data presented in Section 2.2.1.2 to report the source of the reported data. In addition, please provide the missing temperature data or revise Section 2.2.1.2 to clarify that process monitoring data were only collected and reported for half of the year. Additionally, please consider numbering the tables in Appendix B so that they can be easily referenced in Section 2.2.1.2.

4. **Table 2-8, Fixed Laboratory Analytical Results, Page 2-22 to 2-28 and Appendix D, SVE Data Validation Narratives:** Some result qualifiers and identification numbers presented in Table 2-8 are different from what is presented in Appendix D. For example, the sample location ST012-SVE05M in Table 2-8 has the same results as ST012-SVE05H-102318 in Appendix D (PDF Page 8128) but the identification notation for depth is different (i.e., "M" versus "H"). Additionally, for the same sample, ethyl benzene was "F" qualified in Appendix D but is "J" qualified in Table 2-8. Please resolve the discrepancies between Table 2-8 and Appendix D and ensure the same information is reported in both.

5. **Section 2.3.2, Notable Trends, Page 2-32 and Appendix E, SVE Historical Hydrocarbon Concentration Data:** Section 2.3.2 states that the range of VOCs were elevated in five well locations, noting startup concentrations ranging from 8,000 parts per million by volume (ppmv) to 30,000 ppmv but several of the figures indicate that the starting concentrations were much higher in some instances, depending on the analysis considered. For example, Figure E-3 (SVE01 Middle) indicates that the initial flame ionization detector (FID) measurement was approximately 230,000 ppmv total petroleum hydrocarbons (TPH), while the laboratory analytical data result was 30,000 ppmv TPH. The text should be revised to clarify whether the data discussed in the text is FID data, photoionization detector (PID) data, or laboratory analytical data. Please revise Section 2.3.2 to clarify the types of data being discussed and ensure the data reported is consistent with the figures.

6. **Section 2.3.2, Notable Trends, Page 2-33:** The text should discuss trends in more detail and clarify the statements made. Further, the text states, "In particular, ST012-SVE03D, ST012-SVE04D, ST012-SVE05D, and ST012-SVE11 have shown reduced O_2 concentrations and increases in VOCs, CO [carbon monoxide], and CH_4;" however, data presented in Table 2-7 (Summary of SVE Gas Measurements) does not support this statement. For example, ST012-SVE03D had an average O_2 concentration of 0% in July-Sept 2018, and increased to 13.5% in Oct-Dec 2018. Table 2-7 also notes that average VOC concentrations were 32,882 ppmv in Apr-Jun 2018, but decreased to 8,265 ppmv in Oct-Dec 2018, indicating that VOC concentrations have decreased, rather than increased. Additionally, the text should discuss other factors, such as the range of temperature that is optimal for biological activity. Please revise the text to revise the statement that discusses trends in O_2, VOC, CO, and CH_4 data to reflect the data presented in Table 2-7. Additionally, please discuss the optimal temperature range for microbial activity and the temperature ranges in the data collected.

7. **Table 3-1, Groundwater Sample Analytical Results by Sample Date and Location for the Reporting Period:** Several columns of data in Table 3-1 are cut off. For example, the column to the right of "Sample Depth" and the column to the right of the analyte on the right-most column (e.g., sec-butylbenzene) on Page 3-4 are cut off. Please revise Table 3-1 to present all data.

8. **Table 3-2, Process Water Sample Analytical Results by Sample Date and Location for the Reporting Period, Page 3-11 to 3-14:** Table 3-2 is not labeled, making it difficult to identify where the table is without scanning the Table of Contents and identifying the page number. Please revise Table 3-2 to include a label.

9. **Section 3.1.5, Site Temperature Monitoring, Page 3-22:** Section 3.1.5 mentions several temperature monitoring points that are not depicted on any figure provided. Please include the location of the temperature monitoring points discussed in the text on a figure in the Draft Report.

10. **Section 3.4.1, Contaminant and Terminal Electron Acceptor Distribution, Page 3-20:** Section 3.4.1 mentions the results presented on Figures 3-4 through 3-15 and provides a brief overview of the data but does not discuss how the inferred areas (dashed boundary lines) will be addressed. Additionally, the text states that low nitrate and sulfate coupled with higher iron concentrations in areas with higher benzene are related to biological activity but does not discuss why. Please revise Section 3.4.1 to provide additional information regarding the data gaps presented by nitrate, iron and sulfate results and discuss how the trends indicate that biological activity is occurring.

11. **Appendix B, SVE Field Monitoring Results:** Some of the SVE Systems Monitoring Record table entries note that values are "#VALUE!" or not available (NA) but these entries are not discussed in the notes or the text. For example, SVE-10 on 05/10/2016 (Page 64) and on 08/04/2016 (Page 64) include "#VALUE!" and/or NA data

placeholders. Please revise the tables to include a note that explains why some entries are highlighted and ensure any missing values are discussed in the text.

12. **Appendix E, SVE Historical Hydrocarbon Concentration Data, Figure E-2, SVE01 Shallow:** There is no data presented on Figure E-2. Please revise Figure E-2 to include the missing past and present data collected from FID, PID, and lab analytical data.

13. **Appendix I, Pilot Study Field Log Data and Extraction Volume Estimates:** Most of the Wellhead Field Log sheets in Appendix I include green or yellow highlighted entries; however, the significance of the highlighting is not discussed in a table note or in the text. Please revise Appendix I to clarify the significance of the highlighted table entries.

14. **Appendix O, Annual Groundwater Monitoring Report, Section 1.1, ST012 Background, Page 1-2, and Section 3.1.2, LNAPL Measurements and Bailing/Removal Activities, Page 3-2:** The first sentence in Section 3.1.2 indicates that the presence of light non-aqueous phase liquid (LNAPL) was due to "regular monitoring and pumping of wells with LNAPL" but according to Section 1.1, LNAPL presence has been attributed to the historical release of jet propulsion fuel grade four (JP-4) and aviation gasoline. Please revise the text to consistently attribute the presence of LNAPL at ST012 releases of JP-4 and aviation gasoline.

15. **Appendix O, Groundwater Annual Report, Section 3.1.2, LNAPL Measurements and Bailing/Removal Activities, Pages 3-1 to 3-2, Table 3-2, ST012 LNAPL Detections and Volumes Bailed/Removed in 2018, 2017, 2016, 2015, 2014, 2013, and 2012, Page 3-9:** The text is inconsistent with Table 3-2. Section 3.1.2 states that a total of six gallons of LNAPL were removed from ST012-W37 prior to sampling, less than 1-inch of LNAPL was present at ST012-W11, and that the total volume of LNAPL bailed/removed from all ST012 wells was approximately 159 gallons in 2018 (line 430). However, this information is inconsistent with Table 3-2, which states that well ST012-W11 and ST012-W37 had 16.0 and 37.6 gallons of LNAPL removed in 2018, respectively. Additionally, the total volume LNAPL removed is noted to be 53.6 gallons per Table 3-2 whereas, Section 3.1.2 states that 159 gallons were removed. It is noted that the table only lists three wells and the text states that 159 gallons was from "all wells" but it is unclear why those additional wells are not listed in Table 3-2. There are inconsistencies for other years, including Year 2016 which states that the total volume of LNAPL removed was 377.5 gallons in 2016, but Table 3-2 lists 316.6 gallons. Please resolve the LNAPL volume discrepancies between Section 3.1.2 and Table 3-2.

16. **Appendix O, Groundwater Annual Report, Section 3.3.2, Volatile Organic Compound Concentrations, Page 3-5:** Section 3.3.2 states that, "Time-concentration graphs for VOCs that exceeded cleanup levels at monitoring wells ST012-W11, ST012-W30, and ST012-W37 are provided in Figures 3-6a through 3-6c, respectively;" however, it is unclear why time-concentration graphs are only provided for those three wells. Please revise Appendix O to include time-concentration graphs for all wells or explain why time-concentration graphs were not provided for all wells.

17. **Appendix O, Groundwater Annual Report, Section 3.1.2, Table 3-2, ST012 LNAPL Detections and Volumes Bailed/Removed in 2018, 2017, 2016, 2015, 2014, 2013, and 2012, Page 3-10:** Table 3-2 includes several blue highlighted cells, but the table notes do not discuss the significance of the blue highlight. Please revise the Table 3-2 notes to discuss the significance of the blue highlight.

18. **Appendix O, Groundwater Annual Report, Section 4.1.2.1, Benzene, Page 4-2, and Figure 3-7, ST012 LSZ Benzene Concentrations in Groundwater November 2018:** Section 4.1.2.1 discusses lines of evidence that resulted in the plume footprint shown in Figure 3-7, but Figure 3-7 does not include the well locations discussed. For example, the first bullet point notes that the upgradient well ST012-C01 and abandoned monitoring well ST012-U13 have not had any detections, but these well locations are not included on Figure 3-7. Please revise Figure 3-7 to add locations of the wells used as lines of evidence for the plume footprint. Alternatively, please provide a reference to a figure that includes these well locations.

19. **Appendix O, Groundwater Annual Report, Section 4.2, Recommendations, Page 4-4:** Section 4.2 does not discuss any future plans or recommendations to address the data gaps discussed in the reports and presented on figures. For example, the western boundaries of both LSZ naphthalene and benzene concentrations are undefined as presented on Figure 3-7 and Figure 3-8. Please revise Section 4.2 to discuss additional recommendations or future plans to address data gaps associated with the 2018 monitoring data.

Thank you again for the opportunity to comment on this report. If you have any questions I can be reached at (415) 972-3150.

Sincerely,

Carolyn d'Almeida

Carolyn d'Almeida
Remedial Project Manager

cc: Wayne Miller, ADEQ
Ardis Dickey, AFCEC/CIB